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SITE FOR THE LARGE REFLECTOR OF THE
ARGENTINE NATIONAL OBSERVATORY.

By C. D. PERRINE.

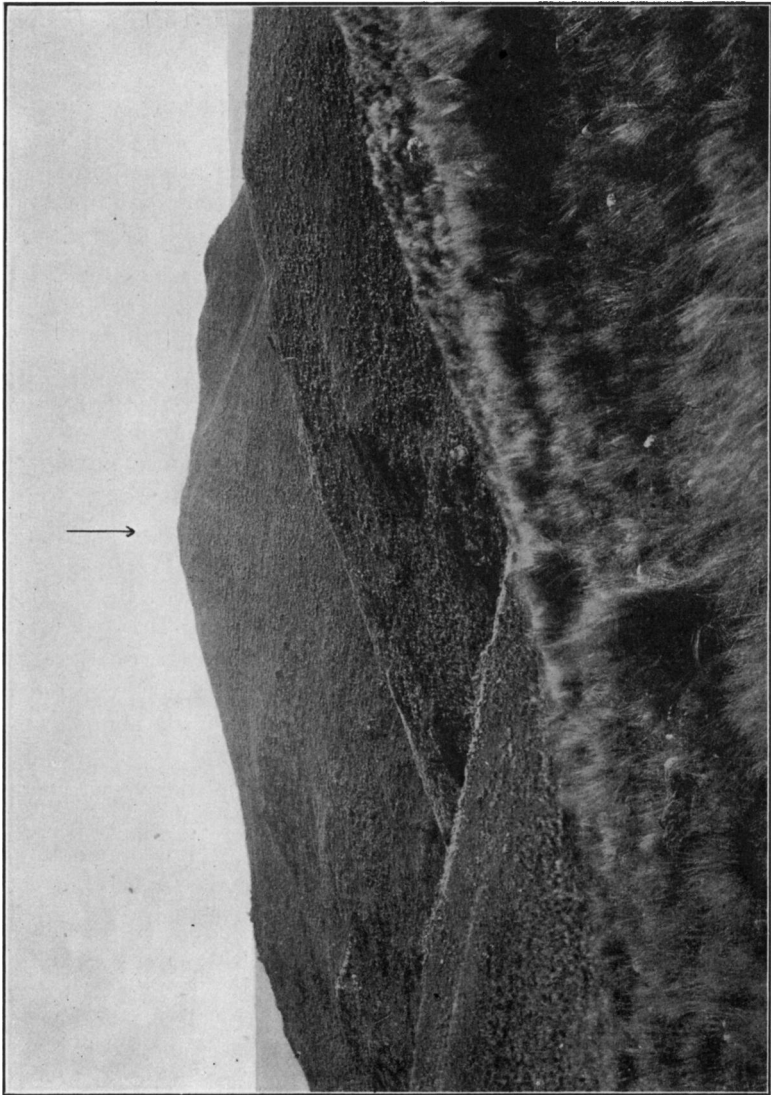
A site for the reflecting telescope of $1\frac{1}{2}$ -meter aperture, now in construction for the National Observatory of the Argentine Republic, has been chosen near the southern extremity of the Sierra Chica about 40 kilometers southwest of Córdoba. This range of mountains is some 200 kilometers in length and from about 1200 meters altitude at its southern extremity to nearly 2000 meters at the northern end where it connects with the much more extensive Sierra Grande farther to the west.

A considerable portion of this latter range is of exceptional interest. From a point almost due west of Córdoba where there is a group of needle-like peaks known as the Gigantes rising to altitudes of 2300 meters, the top of the range for over 100 kilometers to the south is a nearly level mesa averaging about five kilometers in width and over 2000 meters in altitude. The sides of this portion (particularly the west side) are steep and precipitous. The plains at the foot of this range vary from about 400 to 800 meters above sea-level. The mesa itself (known as the Pampa de Achala) is covered with a luxuriant carpet of grass and water is fairly abundant. Large herds of cattle are pastured on this pampa.

With the exception of the grass on the top, the vegetation in this region is scant.

The Sierra Chica is of the usual type of low mountain formation, resembling in general appearance the Coast Range to the west of Mount Hamilton, except that there is much less vegetation in the Sierra Chica.

The site selected for the reflector is a rounded knob 1200 meters above sea-level on the west side of the range, not far from its southern extremity, overlooking the valley between Chica and Grande. From its summit are visible Alta Gracia, the nearest railway station, 20 kilometers distant to the south-east; Córdoba, 40 kilometers to the northeast, and the extensive pampas for a long distance to the north, east and south, as well as the higher mountains to the west and north.



SITE FOR THE ARGENTINE REFLECTOR
(From the east)

The site is but a kilometer from the main new highway which crosses the Sierra Chica at this point from the plains at the east (Alta Gracia, Córdoba and the pueblito of Falda del Carmen) to the great estancia of Bosque Alegre (in the edge of which the site is situated) in the valley between the Chica and Grande, to the west. From Bosque Alegre the highway passes north some 30 kilometers to the southern end of Lago San Roque which supplies Córdoba with electric power and water and also an extensive region about with irrigation. At the southern end of this lake the road meets three others, one crossing the range to the east to Córdoba; one extending around the lake and to the north thru the valley to Cosquín, Capilla del Monte, etc., and a new road to the west, which crosses the Sierra Grande north of the Gigantes and gives access to the great valley region farther to the west.

This system of roads is probably the finest in the Republic. Many of them, including the one giving access to the Observatory site, are newly made within two years and all are macadamized for the greater part of their lengths, making a good system of automobile highways. For the most part the scenery is interesting and picturesque.

The site for the reflector, which comprises fourteen hectares, is being donated by Mr. Henry Reynolds, owner of the estancia Bosque Alegre. It contains, besides the hill proper upon which will be located the telescope, an extension to the canyon to the south, in which is a small stream of perpetual water.

The hill is without trees, but is covered with a thick growth of tuft-grass, in many places waist high, which should be almost as good as trees as a protection against excessive heating and radiation.

Before anything was known of this site, many points in the mountains to the north had been explored and five of them tested by sending observers and instruments to secure meteorological observations and tests of the transparency and steadiness of the atmosphere. These stations were at altitudes of from 600 to over 1700 meters—or from 100 meters to 1200 meters above the surrounding pampa. Two

of the stations were at altitudes of over 1700 meters, one just north of the Gigantes on the Pampa San Luis (which resembles to a considerable extent the higher Pampa de Achala, a little to the south), the other nearly a hundred kilometers to the north on the top of abrupt peaks. It was desired to test the high pampa regions especially, for if the astronomical conditions were good there, they were otherwise ideal for a station.¹

Several facts stood out clearly from these observations which are of sufficient general interest to give here:

A. One hundred meters above the pampa was not enough to greatly reduce the diurnal range of temperature. The night range, however, was reduced to half or less.

B. Altitudes of 400 meters above the pampa (two stations) showed a reduction of diurnal range to 7° or 8° C. (half that on the pampa) and a nocturnal range of 2° to 3° Centigrade on clear nights.

There is reason to believe that under actual observing conditions the temperature range will be even more favorable than the results given above. Photographic observations at the two stations of intermediate altitude were made both at the beginning and end of 14 nights in early June and early November in 1913. The average interval of these 14 series was $8\frac{1}{2}$ hours and the mean range of temperature $1^{\circ}.07$ C. In one of the series observations were also made about three hours after dark on all but one of the nights. Two of the remaining nights, one at each station, were abnormal, the temperature changing $3^{\circ}.8$ in one case and $4^{\circ}.0$ in the other. Omitting these two cases, the remaining 11 give an average interval of seven hours and an average range of temperature during that time of $0^{\circ}.6$ C. It seems probable, therefore, that on a majority of the better nights from about two hours

¹ The opinion has gained such currency here that it is the intention to move the entire observatory to the mountains that I take this opportunity to say that such is *not* the case. The practical advantages are so great of having all the work possible done in or close to a large city that it is intended to continue that policy and only make such observations in the mountains as require the better conditions found there, reducing and discussing even these observations to a large extent in Córdoba. The location of the Observatory on the bluff overlooking the city of Córdoba is satisfactory for meridian circle work and for most photographic work with small and medium-sized telescopes.

after dark, the range of temperature should seldom exceed 1° C. in the open air. If any different, the site at Bosque Alegre should be slightly better than the two at which the above results were obtained. Altho the above data is limited, there is no reason to believe that it is not entirely representative.

Simultaneous observations in Córdoba gave a mean range of temperature of 6° C. for the same intervals, *falling* temperature in practically all cases.

c. Altitudes of 1200 meters above the pampa (two stations) gave a diurnal range of temperature of $4^{\circ}.6$ and $6^{\circ}.2$ C. (one-third that on the pampa) and nocturnal ranges of about 2° C.

The conditions at these high points were variable, due to the high gusty winds, and much less suitable for observing than lower altitudes.

d. At 100 meters above the pampa there appeared to be no more wind at night than on the pampa—where it is usually almost perfectly calm. Even during stormy weather it is the rule for the wind to cease entirely at night at the Observatory.

The two stations of mid elevation showed considerably less wind at night than in day time, but usually a breeze of from 5 to 15 kilometers per hour.

The two high stations showed strong winds most of the time, highest at night, when they often reached 50 and 60 kilometers. There appeared to be little choice between the high small pampa and a peak in either the matter of temperature or wind.

e. On account of the wind it is difficult to draw any very reliable conclusions as to the steadiness and smallness of image, the observations being photographic, and adequate wind protection being impossible under the circumstances. To the naked eye the stars were very steady and free from twinkling under all normal conditions.

f. The transparency of the air at all altitudes is good. At the higher altitudes the sky was very black. I have never seen the sky darker right up to the limb of the Sun than at one of the 1700-meter stations.

The details of the observations made at these different stations will be published in a volume of the *Resultados*.

A site had been selected about 300 meters above and near to the generating station of the electric company at Casa Bamba, and negotiations had been under way for some time for a site when the location at Bosque Alegre was brought to my attention. The accessibility of this point, together with the favorable appearance of other conditions, caused me to send an expedition and obtain a series of meteorological observations similar to those at the other points. The results were so favorable, slightly better than at any other point, that the offer of sufficient land by Mr. Reynolds was at once gladly accepted.

Notwithstanding its altitude, the wind was consistently less at night than in the day time, as favorable in that respect as any of the other stations tested except possibly the very lowest. The day-time winds at the Bosque Alegre site averaged 19 kilometers per hour.

The ranges of temperature were essentially the same as at the other stations tested, for the same altitude.

The number of clear nights will not differ greatly among the points tested nor from those available in Córdoba. The higher mountains are occasionally observed to be covered by clouds when it is clear on the pampa, so that there may be slightly fewer nights clear there. This is by no means certain, however, for the reverse has been observed in a few cases, and there are some conditions which would probably tend to equalize the above possible disadvantage.

There is one condition which is general in all this region and which is of prime importance for long programs of observation. The clear nights are distributed thruout the year with considerable uniformity. There are fully as many clear nights in winter, on the average, as in summer, and usually a slight excess.

The land has been surveyed, boundary monuments erected, and the site for the dome cleared almost to the level for the foundations for the walls. The road to connect the Observatory peak with the main highway is nearly completed, and a small catchment reservoir in a nearby gulch,

to provide water for building purposes, has been constructed.

The parts of the dome are in Alta Gracia, awaiting the completion of the connecting road to be hauled to the summit.

As soon as the freezing weather is over it is hoped to commence the walls and to complete them during the summer, ready for the mounting of the dome the following winter, or sooner if possible.

The back of the large mirror has been ground and polished, the edge is ground and grooved, and the 90^{cm} flat for testing is nearing completion.

Observatorio Nacional Argentino,
Córdoba, June 29, 1916.